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Functional Consequences of Road Traffic Injuries: Preliminary Results from PERSIAN Traffic Cohort (PTC)

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Abstract

Introduction: Traffic injuries are one of the main causes of death worldwide. After decreasing mortality rates and improving the recovery of injured patients, long-term functional consequences need to be addressed. The purpose of this study was to assess the functional outcomes of road traffic injuries and their predictors six months after hospital discharge, based on the preliminary results from PTC.

Methods: A cross-sectional study based on PERSIAN Traffic Health and Safety Cohort Study was performed. Data were collected using the 12-item World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) with six domains (cognition, mobility, self-care, getting along with others, life activities, and participation), filled-in by 180 injured adults (age >18 years) at six-month follow-up after hospital discharge during October 2019. These patients were hospitalized after road accidents at two referral trauma centers, (from 23 September 2018 to 20 March 2019).

Results: The majority of participants were men (82.7%), (Mean age =38.8). The mean score of WHODAS 2.0 was 17.8) SD=9.1). The highest score was estimated for the self-care dimension 3.3 (SD=1.8), and the lowest score for getting along with others 2.4 (SD=1.2). Age, gender, physiotherapy, injury localization including head and face, spinal cord, and upper extremity were predictors of WHODAS 2.0 score in various dimensions ($p<0.05$).

Conclusion: The current study identified some functional disabilities among patients sustaining road traffic injuries. It is evident from the results that a proportion of patients do not recover six months after the injury and suffer a disability, especially in self-care, mobility, and life activities, which potentially prevent them from returning to normalcy. In addition, age, gender, physiotherapy, injury localization was related to WHODAS 2.0 scores

Keywords: Accidents, Road Traffic Injury, Traffic Accidents, Functional Status, WHODAS 2.0, Cohort Studies.

Introduction

Severe injuries are one of the causes of death in the first four decades of life,[1] and more than five million die out of injuries annually. Injuries affect 700 million people all over the world.[2] Multiple trauma is usually caused by a road crash, which is a leading and increasing public health problem in many countries.[3] In Iran, over 21000 Disability-Adjusted Life Years (DALYs) were estimated due to all diseases and injuries, of which 28% were attributed to trauma.[4] Road Traffic Injuries (RTIs) account for about 2600 person-years of life lost[5] that cost Iran about 7.2 billion US Dollars (2.19% of Iran's Gross domestic product (GDP) in 2010).[6]

A considerable number of injured people suffer from long-term physically and mentally impairments, disabilities, and handicaps[3], differing by their types, the number of injuries, and body location.[7]According to the World Health Organization (WHO) definition, disabilities is an umbrella term, covering impairments, activity restrictions, and participation restrictions.[4] Low and Middle Income Countries (LMICs) bear 90% of trauma-related deaths and related disability-adjusted life years, which increase progressively and reduce national income levels.[8] For assessing functional consequences and disabilities, a trauma system monitors the quality of trauma care. Arising the awareness of the functional consequences would improve the probability of recovery from major trauma, and have recommendations for the improvement of rehabilitation services.[9] In addition, it is a clinical and economic obligation.[3]

A wide variety of tools are available for the assessment of post-injury levels of functioning and disability.[10] The 12-item version of the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) with a simple sum scoring method is one of the reliable tools developed by the WHO regarding the Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition). According to the International Classification of Functioning, Disability, and Health, WHODAS measures disability and functional impairments in six domains: cognition, mobility, self-care, getting along with others, life activities, and participation.[11] The WHODAS 2.0, like other generic disability measures was developed to consider problems due to health circumstances include diseases, illnesses, injuries, mental or emotional difficulties, and problems with alcohol or drugs.[12] Regarding the short completion time of the short-form schedule (about five minutes) through either phone or clinical interviewing[13], it explained that 81% of the variance of the full version, the 12-item WHODAS 2.0 was preferred over its 36-item version[13-14], in the current study.

The demographic factors (age and gender), and injury-related factors (localization, severity, number of injuries) are major determinants of functional outcome in some studies.[3] Several studies have drawn attention to the influence of psychological factors, such as depression and posttraumatic stress disorder.[15-16] Despite several studies on psychological factors, the association between functional outcomes and demography, physical health, and hospitalization-related factors in trauma patients has received little attention.[17] On the other hand, road traffic injuries are one of the most significant traumatic patients. These patients face many physical and physiological problems. The main objective of the present study was to explore the functional status of patients with traffic injuries, some related hospitalization, and demographic factors.

Methods

Design

The current cross-sectional study is a preliminary result of a population-based PERSIAN Traffic Safety and Health Cohort (PTC) study on exposures, predictors, and outcomes related to post-crash, started in 2019.[18]

Patients and settings

The study was performed in the metropolitan city of Tabriz in the Province of East

Azerbaijan, Iran, where RTIs are among the ten prominent burdens of diseases.[19] The target population included all patients hospitalized after a road crash in two referral trauma centers, Shohada and Imam Reza hospitals, Tabriz, Iran, from 2018 to 2019 (from 23 September 2018 to 20 March 2019). The study data was about post-injury functioning of survivors, which was collected six months after hospital discharge, during October 2019. The sampling method was convenience sampling. Inclusion criteria included enrolment at baseline, a minimum of 18 years old, provision of informed consent, registration in road traffic registry system in two referral trauma centers, and participation in the second follow-up of a post-crash cohort study. Exclusion criteria consisted of being out of reach due to the wrong phone number for contact, immigration, or refusal. Based on the mentioned criteria, a total of 180 patients were included in the analysis.

Measurement

The post-injury functioning of RTI survivors was examined six months after hospital discharge using the 12-item WHODAS2.0. Based on information gathered at baseline and first follow-up, people eligible to be at the second follow-up (FU2) were chosen and contacted by phone. At FU2, several questionnaires were administered include demographic and economic questions, Post Traumatic Stress Disorder (PTSD), Patient Health Questionnaire-9 (PHQ9), Europe Quality of Life-5 Dimensions-3 Levels (EQ-5D-3L), and WHODAS 12-item tools. This study-utilized data contributed to WHODAS 12-item. Via telephone interview, people were asked about their post-injury functional status as mentioned in the short form. According to WHO simple scoring method, items are responded on a five-point Likert-type scale from 0 to 4, as follows, 0: No Difficulty; 1: Mild Difficulty; 2: Moderate Difficulty; 3: Severe Difficulty; 4: Extreme or cannot do; then scores assigned to each of the items were summed (https://www.sralab.org/rehabilitation-measures/world-health-organization-disabilityassessment-schedule-ii). Accordingly, the lowest and the highest possible scores of the tool are 0 and 48, respectively. Higher scores reflect higher levels of disability.[20]

The WHODAS 2.0 is a common multi-dimensional questionnaire, which is applicable to measure the level of disability across many conditions and has been validated in several languages.[14] So that, this schedule has been translated into sixteen languages in fourteen countries and has been reported to have an adequate internal consistency, construct and discriminate validity, and one-factor structure for the 12-item WHODAS 2.0.[21] The reliability coefficient was calculated at 0·92 in the present study. The instrument is validated for use in the Persian language through a PERSIAN Traffic Cohort study conducted by RTIRC.

Moreover, some of the information at baseline and hospital information system (HIS) in this study include some crash-related exposures such as crash mechanism, demographic information, and hospitalization-related predictors like having surgery, hospitalized ward, status at discharge time, having physiotherapy, as well as external causes (as mentioned in International Classification of Diseases version 10 (ICD-10), chapter XX), trauma clinical characteristics (ICD-10, chapter XI). This information was merged with those obtained from the questionnaire and then was analyzed.

Data analysis

Proportions and means (standard deviation (SD)) were calculated for categorical and continuous variables respectively, including patients' characteristics, hospitalization information, and functional status based on 12-item WHODAS 2.0. The normality of the distribution of variables was tested and confirmed by One-Sample Kolmogorov-Smirnov Test. Spearman correlation test was used to express the relationship among dimensions of WHODAS 2.0. In addition, Mann-Whitney, Kruskal–Wallis tests were used to assess the relationship among demographic, hospital

factors, and WHODAS domains. Data were analyzed using the SPSS 25 (IBM software Version 25.0, Chicago, IL, USA). We considered $p<0.05$ to be statistically significant.

Results

Of the 180 patients in this study, 149 (82.8%) were male. The mean age (SD) was 38.8 (16.7) years old, and 103 injured people (57.2%) were car drivers or passengers. Injured organs of the body are classified into six groups. The most affected organs were head and face (36.7%), and the least was upper extremity (5.7%). Most of the participants were hospitalized in the trauma department (97 patients), and half of the participants had surgery after at Road Traffic Accident (RTA). 85.5% of patients were recovering at discharge. In Figure1-3, some hospital information of injured people is presented.

The mean WHODAS2.0 score was 17.8 (SD=9.1). About 20% of patients had scored more than 24. The highest score was estimated for the self-care dimension 3.3 (SD=1.8), and the lowest score for getting along with others 2.4 (SD=1.3). The scores of other dimensions include cognition, mobility, life activities, and participation were calculated at 2.8 (SD=1.5), 3.2 (SD=2.4), 2.9 (SD=2.2), and 3 (SD=1.7), respectively. In addition, physiotherapy was not prescribed or performed for 134 (74.4%) patients. Only 46 (25.6%) patients completed their physiotherapy. The frequency and mean score of items based on gender are presented in Table 1.

Statistically, all dimensions of the questionnaire were positively correlated, and these correlations were significant ($p<0.001$). The highest correlation was between scores of mobility and life activities ($r= 0.778$), and the lowest correlation was between getting along with and mobility ($r= 0.351$) (Table 2).

There was no significant difference between WHODAS 2.0 domains scores and the role of injured people based on Kruskal–Wallis test. In addition, Kruskal–Wallis test between individual domains of WHODAS 2.0 and age group revealed a significant relationship in domains of life activities ($X^2=11.34$, $p=0.01$), mobility ($X^2=11.19$, $p=0.01$), and participation ($X^2=11.34$, $p=0.02$). Therefore, a U Mann-Whitney test was performed to identify the source of the difference (Table 3). Also, U Mann-Whitney analysis among WHODAS 2.0 domains and other qualitative independent variables revealed some significant results that are presented in Table 3.

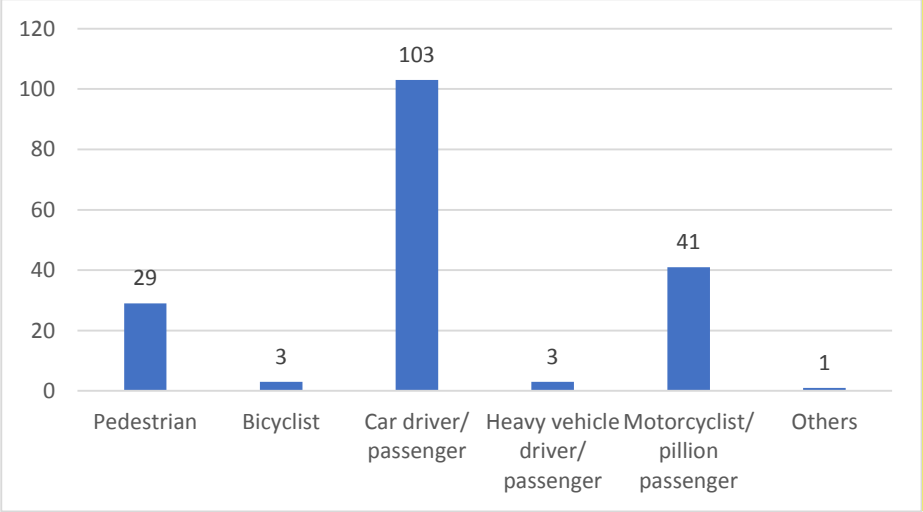

Figure 1. Role of injured people

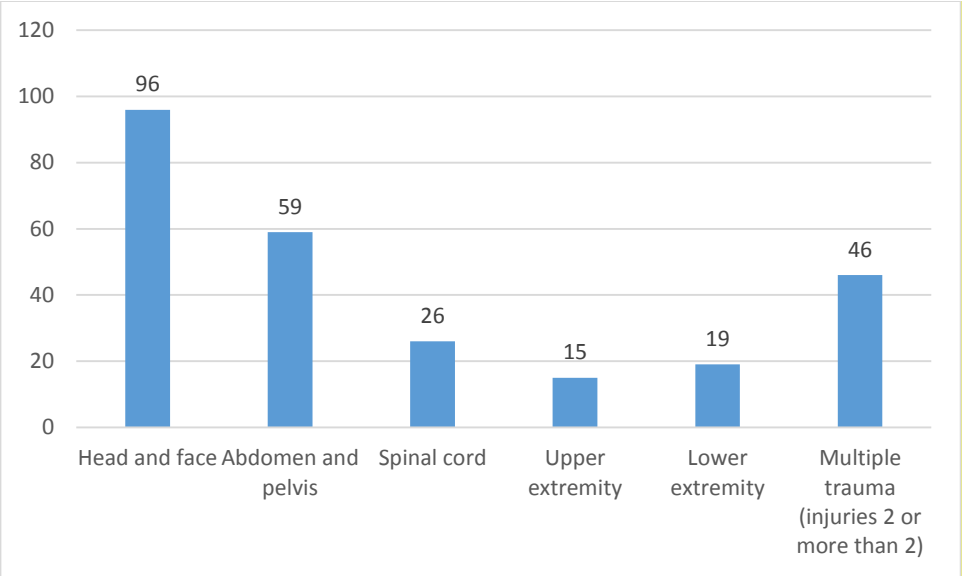

Figure 2. Injury localization

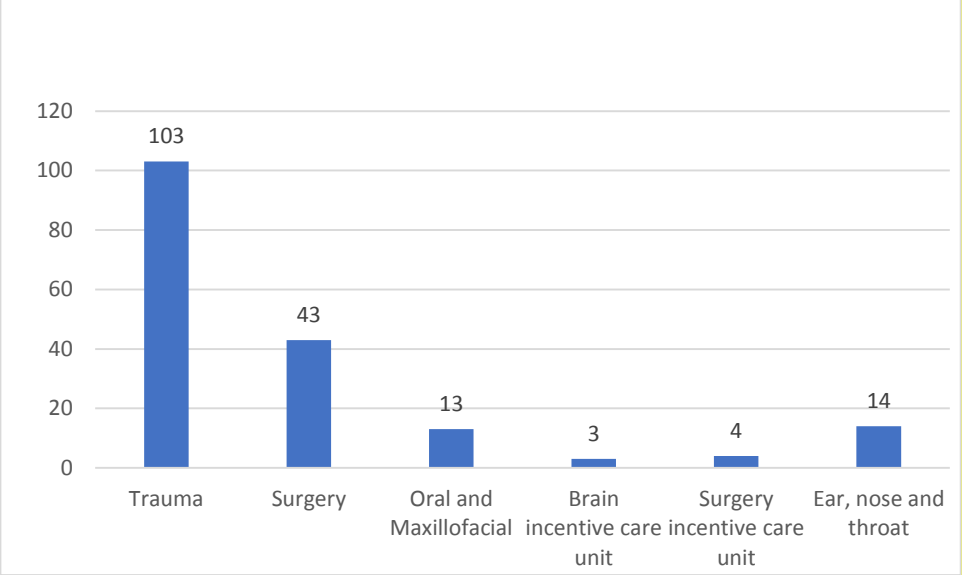

Figure 3. Number of patients admitted to different wards of the hospital

Table 1: Frequency and mean scores of WHODAS 2.0 items

Dimension	Item	Gender	Frequency of five-point Likert (%)					Mean (SD)
			No problem	**Mild problem**	**Moderate problem**	**Severe problem**	**Very severe problem**	
Cognition	Learning a new task, for example, learning how to get to a new place?	Male	0	130(87.2)	0	12(8.1)	7(3.9)	Male: 2.8(1.5)
		Female	0	26(83.9)	1(3.2)	4(12.9)	0	
	Concentrating on doing something for ten minutes?	Male	0	108 (72.5)	11(7.4)	19(12.8)	11(7.4)	Female: 2.7(1.2)
		Female	0	23(74.2)	2(6.5)	6(19.4)	0	
Mobility	Standing for long periods such as 30 minutes?	Male	49(53)	13 (8.7)	35 (23.5)	0	22(14.8)	Male: 3.1(2.4)
		Female	12(38.7)	6(19.4)	8(25.8)	0	5(16.1)	
	Walking a long distance such as a kilometer (or equivalent)?	Male	0	78(52.3)	17(11.4)	37(24.8)	17(11.4)	Female: 3.6(2.4)
		Female	0	11(35.5)	5(16.1)	10(32.3)	5(16.1)	
Self-care	Washing your whole body?	Male	0	98(65.8)	13(8.7)	31(20.8)	7(4.7)	Male: 3.2(1.8)
		Female	0	15(48.8)	4(12.9)	11(35.5)	1(3.2)	
	Getting dressed?	Male	0	103(69.1)	12(8.1)	27(18.1)	7(4.7)	Female: 3.6(1.8)
		Female	0	19(61.3)	4(12.9)	7(22.6)	1(3.2)	
Getting along with others	Dealing with people, you do not know?	Male	0	130(87.2)	8(5.4)	5(3.4)	6(4)	Male: 2.5(1.3)
		Female	0	30(96.8)	0	1(3.2)	0	
	Maintaining a friendship?	Male	0	130(87.2)	4(12.7)	10(6.7)	5(3.4)	Female: 2.1(0.74)
		Female	0	28(90.3)	2(6.5)	1(3.2)	0	
life activities	Your day-to-day work/school	Male	78(52.3)	16 (10.7)	40 (26.8)	10 (6.7)	5(3.4)	Male: 2.8(2.1)
		Female	8(25.8)	4(12.9)	17(54.8)	2(6.5)	0	
	Taking care of your household responsibilities?	Male	0	85(57)	13(8.7)	40(26.8)	11(7.4)	Female: 3.7(1.9)
		Female	0	8(25.8)	4(12.9)	16(51.6)	2(6.5)	
Participation	How much of a problem did you have in joining in community activities (for example, festivities, religious or other activities) in the same way as anyone else can?	Male	0	103(69.1)	11(7.4)	28(18.8)	7(4.7)	Male: 3(1.7)
		Female	0	17(54.8)	6(19.4)	7(22.6)	1(3.2)	
	How much have you been emotionally affected by your health problems?	Male	0	121(81.2)	4(2.7)	14(9.4)	10(6.7)	Female: 3.2(1.5)
		Female	0	22(71)	3(9.7)	6(19.4)	0	

Table 2: Spearman correlation coefficients matrix and probability values of WHODAS2.0 dimensions

Variable	Cognition	Mobility	Self-care	Getting along with others	Life activities	Participation
Cognition	1					
Mobility	0.572** 0.000	1				
Self-care	0.547** 0.000	0.623** 0.000	1			
Getting along with others	0.573** 0.000	0.351** 0.000	0.406** 0.000	1		
Life activities	0.0.585** 0.000	0.778** 0.000	0.753** 0.000	0.386** 0.000	1	
Participation	0.604** 0.000	0.602** 0.000	0.547** 0.000	0.497** 0.000	0.631** 0.000	1

** *P<0.0001*

Table 3: Mann-Whitney analysis test results of participants' characteristics and WHODAS 2.0 dimensions

Variable		U Mann-Whitney	Z	Sig (2-tailed)
According to gender				
Dimension	**Self-care**	3285	-2.43*	0.01
According to having physiotherapy				
Dimension	**life activities**	2078	-2.45*	0.014
	Cognition	2158	-2.46*	0.014
	Mobility	1818	-3.43**	0.001
	Self-care	1971	-3.07**	0.002
	Participation	2227	-2.01*	0.04
According to head and face injury				
	Self-care	3285	-2.43*	0.015
According to spinal cord injury				
Dimension	**life activities**	1581	-1.83***	0.066
	Mobility	1578	-1.82***	0.069
	Self-care	1642	-1.66***	0.096
According to upper extremity injury				
Dimension	**life activities**	695	-3**	0.003
	Mobility	773	-2.53*	0.011
	Self-care	728	-3**	0.003
	Participation	928	-1.87***	0.06
According to 20-40 and 41-60 age group				
Dimension	**life activities**	893	-2.32*	0.01
	Mobility	1708	-1.78***	0.07
According to 20-40 and upper 60 age group				
Dimension	**life activities**	893	-2.58*	0.01
	Mobility	853	-2.8**	0.005
	Participation	914	-2.61**	0.009
According to lower 20 and upper 60 age group				
Dimension	**life activities**	105	-2***	0.058
	Mobility	85	-2.56*	0.01
	Participation	92	-2.49*	0.02
According to lower 20 and 41-60 age group				
Dimension	**life activities**	184	-1.86***	0.06
	Mobility	183	-1.9***	0.057

* *P<0.05, ** P<0.01, *** P<0.1*

Discussion

This pilot study in the post-crash study of PERSIAN Traffic Cohort is one of the few studies in Iran that explores the long-term burden of patients due to road traffic crashes admitted to two referral hospitals in Tabriz City. The collected information was extracted from road traffic registry system. It provided a description of functional status among participants, and its probable determinants based on available data. The study was managed to create evidence on the profile of patients affected by the road traffic crashes, which is very important for policymaking to effectively meet their needs.

In the present study, the mean score of WHODAS 2.0 showed a low functioning disorder. However, the mean was over 24 and more for about 20%, which indicated the existence of a disability. There is some research following our findings. A one-year cohort study in three European countries reported some levels of psychological distress one year after a traumatic event as well as physical disability among more than 30%, at the same time, based on WHODAS 2.0 schedule.[22]Another follow-up study of RTIs survivors in the UK hospital revealed that there was a substantial impact on physical activity, large injury costs, potentially high Quality-Adjusted Life Year (QALY) losses, using the Short Form-36 Health Survey version 2 (SF-36v2), European Quality of Life-5 Dimensions (EQ-5D), and Epidemiologic Studies Depression Scale(CES-D) scales.[23] Rissanen et al. reported that even relatively minor RTIs could lead to a considerably lower Health-Related Quality of Life (HRQoL), especially among women, compared to the non-injured reference group.[24]

In this study, the most reported function disabilities were related to domains of self-care, mobility, participation, and life activities, in a descending order that it may be due to participants' young age. The disrupted daily activities and impaired mobility were barriers to the active population's work and professional activities. Based on studies, about 60% of road crashes victims are young aged 14–45.[25-26] Schluter et al. with the study on the functional capacity outcome of 619 participants showed 54% experienced no limitations, 16% experienced minor limitations, and 29% experienced major limitations, 12 months after hospitalization due to injury.[27] Other studies of patients injured in road crash presented the rates of Post-Traumatic Stress Disorder (PTSD)(up to 45%), the occurrence of depressive symptoms (10%), anxiety symptoms (about 40%), and travel phobia (20%).[28,29] Kuo et al. studied patients with Traumatic Brain Injury (TBI) and Spinal Cord Injury (SCI) using WHODAS and indicated the most functional problems in life activities dimension. However, the score of this dimension was statistically significant between the two groups. [30]

This study revealed that factors like age, gender, injury localization, and physiotherapy were relevant to WHODAS dimensions. A longitudinal cohort study produced previous disability, obesity, and injury severity were related to post-injury disability among hospitalized and none-hospitalized.[31] In another study, ethnicity, length of stay (LOS), education, and comorbidity were significant predictors of outcome based on the Glasgow Outcome Scale Extended (GOS-E). [32] Alharbi et al. in a comprehensive review confirmed some factors associated with functional outcomes among adult trauma patients and clustered into six categories; (1) location and severity of the injury;(2) hospital predictive; (3) demographic features; (4) social and family supports; (5) compensation system process and fault in the road

traffic crash; (6) previous health status.[33] Several of these factors were also confirmed in the present study.

There is no significant difference between WHODAS 2.0 domains scores and the role of injured people in the present study. Being a two-wheel rider or a pedestrian was revealed in the literature as a predictive factor for the risk of poor outcome in some studies.[34-35] Physiotherapy was associated with mobility, cognition, and life activities based on results. Similarly, the results of a single-blind prospective randomized trial on 71 patients were shown to have significant improvement in the severity of neck pain and cervical movement after outpatient physiotherapy one and two months after injury. In addition, 66 patients who received inclusive advice on home mobilization from a physiotherapist presented a similar improvement.[36]

Some main variables affect the recovery process. Kevin et al. reported that patients with severe injuries (LOS≥ 7 days and Injury Severity Score (ISS) 12+) had poorer recovery 12 months after the injury. Also, post-injury mediators include baseline 12-Item Short Form Survey (SF12) scores, baseline pain, baseline psychological status, and compulsory third party insurance (CTP) claimant have an essential role in influencing long-term health outcomes.[37] Tournier et al. resulted in whiplash injuries; the pain was an intermediate factor between whiplash grading, health status, and Quality of Life (QOL).[38] Elbers et al. confirmed some factors that contributed to weak outcomes containing the role of negative perception and the stress-related claims process.[39] It can be concluded from these studies, some hospital factors, comprising the length of stay and the severity of the injury, affect long-term outcomes. On the other hand, mental state, baseline pain, and even the patient's financial status affects long-term health status after trauma.

Conclusion

The current study identified some functional disabilities among patients sustaining RTIs. It was evident from the results that a proportion of patients don't recover six months after the injury and suffer a disability, especially in self-care, mobility, and life activities. In addition, Age, gender, physiotherapy, injury localization were related to WHODAS 2.0 scores.

These results highlight the importance of a comprehensive understanding of the long-term impact of the injury on an individual. People with poor functional or mental health are at-risk and need special attention. A short screening and assessing disability could speed up identifying disabilities and prevent costly assessment. Also, such screening helps to efficiently allocate recourses and policymaking. Future research with larger samples of patients is necessary to increase our understanding of long-lasting disability. Due to the lack of post-event information, in many parts of Iran, it is recommended to establish an integrated post-injury registry system including items such as the person's mental state, as well as a comorbidity in much more details and so on.

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Conflict of Interest Disclosures

None.

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Authors' Contributions

AJ, FP, HP, MR, and HS designed and coordinated the study. YM and RZ conducted the literature review. AJ, RZ, ASH, SHB, and YM contributed to the data collection. YM, AJ, HS, NSH, and ZI analyzed and interpreted the findings. YM and HS wrote the initial draft of the manuscript. All authors have read and approved the final manuscript.

Ethical Statement

The current study was approved by the Regional Research Ethics Committee of Tabriz University of Medical Sciences (ethical code: IR.TBZMED.REC.1398.543). Although patients' participation in the research was voluntary, and they informed oral consent was obtained before the interview.

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